Total Pages: 2

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CH203

Course Name: PARTICLE TECHNOLOGY

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

1 a) How will you proceed to compute the free settling velocity of a spherical particle in water? (5)

b) What happens when near size particles are fed to the screen? (3)

c) Table salt is being fed to a vibrating screen at the rate of 180 kg/hr. The desired product is -30 +20 mesh fraction. A 30 mesh and a 20 mesh screen are therefore used, the feed being introduced on the 30 mesh screen. During the operation it was observed that average proportion of oversize(from the 30 mesh screen):oversize(from the 20 mesh screen):undersize (from 20 mesh screen) is 2 : 1.5 : 1.Calculate the effectiveness of the screen from the following data: (7)

Note: Data for the feed, oversize and undersize is given in mass fraction

Mesh	Feed	Oversize from 30 mesh screen	Oversize from 20 mesh screen	Undersize from 20 20 mesh screen
-85 +60	0.097	0.197	0.026	0.0005
-60 +40	0.186	0.389	0.039	0.0009
-40 +30	0.258	0.337	0.322	0.0036
-30 +20	0.281	0.066	0.526	0.3490
-20 +15	0.091	0.005	0.061	0.2990
-15 +10	0.087	0.006	0.026	0.3470

2 a) What are the different stages of separation techniques of particles that equally fall but have different density and size? (5)

b) Is it true that hindered settling velocity is more than free settling velocity? Justify your answer with equations. (5)

c) What is the significance of sphericity, volume shape factor and surface shape factor? (5)

3 a) Find the sphericity of the cube of dimension $a \times a \times a$. (5)

b) The size analysis of a powdered material on a weight basis is represented by a straight line from 0% weight at 1micron particle size to 100% weight at 101 micron particle size. Calculate the Sauter diameter of the particle (7)

c) Name any three floatation agents (3)

PART B

Answer any two full questions, each carries 15 marks.

4 a) What are steps of batch filtration cycle? Why batch filtration equipment's are generally operated at constant rate and then at constant pressure? (5)

b) Which parameter measure the resistance offered by a cake? Write any three empirical correlations to calculate the same (5)

c) Write the working of any one batch centrifugal filter equipment. (5)

5 a) The collection efficiency of a cyclone is 45 per cent over the size range 0-5 μm,80% over the size range 5-10 μm, and 96% for particles exceeding 10μm.Calculate the efficiency of collection for a dust with a mass distribution of 50 per cent 0-5 μm,30 per cent 5-10 μm and 20 per cent above 10 μm (5)

b) How do bag filter work. Explain with figure. (5)

c) Name any one continuous filter equipment with general equation for the same. (5)

6 a) Derive the filtration equation for batch filtration at constant pressure starting from Kozenys equation (10)

b) What is the effect of particle size on the collection efficiency of gas cyclone? (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) What is the necessity for a closed circuit grinding? How is it different from open circuit grinding? (6)

b) What rotational speed in rpm would you recommend for a ball mill that is 1000 mm in diameter charged with 75 mm balls? (4)

c) How the extent of mixing is measured? How the mixing index and time is related? (10)

8 a) What are the factors affecting size reduction? (5)

b) Which grinding mill will you prefer for paint, pigment industries and cosmetic industries where iron contamination is objectionable. How does it work? (5)

c) The following data are given for a horizontal screw conveyor for handling moulding sand in a foundary. (7)

Bulk density of material=1600 kg/m^3

Diameter of the screw=0.4 m

Screw pitch =0.32 m

Conveying length =15 m

Filling coefficient =0.125

Speed of screw shaft =40 rpm

Reducer efficiency =0.77

Total coefficient of resistance =4.0

Determine i) Rate of conveying the material in kg/hr and

ii) Motor power

d) List any three types of material handles in a screw conveyor (3)

9 a) A material is crushed in a Blake jaw crusher such that the average size of the particle is reduced from 50 mm to 10 mm with the consumption of energy of 15 KW/(kg/s).What would be the consumption of energy needed to crush the same material of average size 70 mm to an average size of 20 mm: (10)

i) Assuming Rittingers law applies?

ii) Assuming Kicks law applies?

Which of these results would be regarded as being more reliable and why?

b) Derive Janssen equation for storage bins. (10)

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